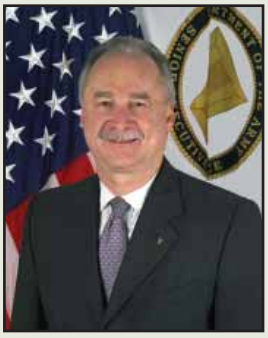
Technology Initiatives in Support of Joint Warfighters — Current Initiatives



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Our Army and Nation remain engaged in a global war on terror that demands we maximize each member's contribution from the joint team. In this article, I want to discuss how U.S. Army Space and Missile Defense Command/U.S. Army Forces Strategic Command (SMDC/ARSTRAT) continues to explore better ways to meet its ever-growing mission demands. This article explores current initiatives that will improve support to missile tracking and testing and Space launch efforts at the Ronald Reagan Ballistic Missile Defense Test Site (RTS)/U.S. Army Kwajalein Atoll (USAKA); support to the joint warfighter through the use of operationally responsive Space and high altitude platforms; and the contributions of the Big Crow Project Office.

Real time mission data from the Pacific Rim possible through fiber optic cable

SMDC/ARSTRAT supports the Missile Defense Agency's (MDA) efforts to build a missile defense system through real-time mission support at RTS. Negotiations continue for the installation of a submarine fiber optic cable to be in place by Fiscal Year 2008 between RTS and the continental U.S. (CONUS) and other dispersed locations. This multi-million dollar cable will stretch almost 2200 miles from USAKA in the Republic of the Marshall Islands (RMI) — through the Federated States of Micronesia (FSM) — to Guam. This project, known as the Kwajalein Cable System (KCS), is a key element of the USAKA strategic vision to enhance customer support in the areas of theatre and ballistic missile testing and Space operations.

Low bandwidth terrestrial communications and the latency and availability of satellite communications currently restrict the amount of real time information that can be transmitted between RTS and CONUS. High bandwidth fiber connectivity will allow real-time information such as visualization, video images and sensor-tracking displays to be transmitted directly to CONUS locations. This high bandwidth connection will speed distribution of mission data and provide analysis more quickly to users. Additionally, this new enabler will allow USAKA, and test customers, to remote some technical capability to SMDC/ARSTRAT locations in Huntsville. This will allow programs to meet many of their test objectives without sending large numbers of personnel to Kwajalein Atoll.

U.S. Army Kwajalein Atoll (USAKA)

The KCS project directly complements the Department of Defense and Army transformation efforts to create a secure, robust optical Internet Protocol terrestrial network — also known as the Global Information Grid. The Defense Information Security Agency will perform the contracting actions necessary through its contracting activity, the Defense Information Technology Contracting Office. The KCS will be the first land line connection between USAKA and CONUS, providing reliable and timely data transfer. High bandwidth connectivity will greatly benefit RTS as the primary ground-based missile defense test site and an integral participant in ballistic missile development.

The FSM Telecommunications Corporation and the Marshall Islands National Telecommunications Agency are negotiating to purchase fiber optic bandwidth on this cable system. Plans are to finance the project through the Rural Utility Services, an agency of the U.S. Department of Agriculture. Both the FSM and RMI are anxious to acquire the fiber to their countries since they view it as important

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for economic growth as well as for improving quality of life for their citizens.

The KCS will allow a vast increase in test and operational support capability for USAKA/RTS. Several organizations within the U.S. Pacific Command (PACOM) have already contacted USAKA about establishing remote UHF, VHF and HF communication sites. The U.S. Air Force has requested real time display of all Space surveillance data and customers conducting tests could reduce their footprint at USAKA, because the data from a test could be displayed real time anywhere in the world.

USAKA/RTS Spacelift Vision

In addition to its missile tracking and testing mission, RTS also offers several unique features that are advantageous when considering locations for Space launch operations, especially operationally responsive Spacelift. Kwajalein Atoll is part of the Marshall Islands situated in the West Central Pacific Ocean at a near equatorial location of about 9 degrees North latitude.

This location provides two advantages: 1) Space launches to the east realize significant benefits from the rotational velocity of the Earth. From the launch vehicle standpoint, this translates to a significant increase in payload capacity to orbit versus CONUS launch sites. 2) Space launches into geosynchronous orbit, the most significant commercial orbit, require a smaller plane change (from 9 degrees to equator) than other launch sites. Compared to Cape Canaveral, Fla., 20 percent less velocity is required.

There are no U.S.-based equatorial launch sites from which Space launch customers can conduct launches. Although Low Earth Orbits (LEO) with low inclinations can be achieved from Cape Canaveral, launching from this location requires an extremely inefficient dogleg maneuver which reduces the payload and increases the fuel requirements. One possible U.S. equatorial launch option is the Boeing "Sea Launch" platform. "Sea Launch," however, can be very expensive due to the large personnel and logistical support requirements. The last alternative is launching from foreign locations. French Guiana has an equatorial launch location. This can be an expensive option in addition to issues with classified payloads. This presents a significant obstacle to many payload providers due to legal, security and technology transfer concerns that significantly limit the ability to launch U.S. payloads on foreign launch vehicles from the CONUS-based Space ports and employ extremely costly and inefficient dogleg trajectories to achieve low inclination orbits. Due to the unique status of Kwajalein, the potential exists to provide a near equatorial launch site for a U.S. launch vehicle provider while avoiding export considerations.

Another significant advantage enjoyed by Kwajalein is the potential to fly a wide variety of trajectories and launch azimuths as a result of the extraordinary low population density in the RMI. This is the same advantage that has resulted in the U.S. using Kwajalein as its primary ballistic missile test site for more than 40 years. The total land area of the RMI is only 70 square miles and thus it is relatively difficult to endanger personnel and property through an errant missile.

A closely related advantage, a result of the RMI consisting primarily of deep ocean area, is that there is relatively little land area to be considered in terms of missile debris. Most launch vehicle contractors have encountered the stringent regulations associated with CONUS operation and would realize significant operational savings at Kwajalein.

Another factor is the advantage of collocating a Space launch facility at the range. Operations at Kwajalein enjoy the advantages of favorable safety, security and environmental constraints with high levels of radio frequency isolation. The suite of instrumentation available at Kwajalein is unparalleled in the world with significant wideband connectivity to CONUS locations via DS3 and soon with fiber. This offers the potential to provide a level of "diagnostic" information unavailable at any other launch facility in the world. This can be particularly important for relatively immature launch vehicles that are likely to experience flight anomalies.

An additional factor related to collocation with the range is the nature of the community at Kwajalein. The entire Kwajalein community is focused on missile test and associated support. The level of experience and expertise is the highest in the world and provides a tremendous pool of talent to assist the launch vehicle and payload personnel in addressing any issues associated with their operations.

The Kwajalein community is also very comfortable with a wide variety of missile flight test operations thus there is little likelihood of community resistance to introduction of a new launch vehicle, as one would expect to encounter at some other launch sites. Typical expenses associated with community outreach, town hall meetings, local permits, etc., would largely be eliminated at Kwajalein.

The USAKA/RTS equatorial location, unparalleled instrumentation and extensive logistical infrastructure offer a major advantage for a Space launch complex and support Department of Defense's Operationally Responsive Space (ORS) program. Under this concept, multiple boosters and payloads would be pre-positioned at USAKA. Different trajectories would be developed for each contingency. If a strategic need arises, entire new constellations could be launched to achieve needed satellite coverage.

Operationally Responsive Space Program

SMDC/ARSTRAT is actively involved in the ORS Program, a joint U.S. military initiative with the goal of providing tactically responsive, operationally relevant Space capabilities to the warfighters on the battlefield. The goal is to provide and exploit on-orbit capabilities quicker than today, with a shorter development and acquisition cycle. To achieve this goal, the Department of Defense is considering technologies such as a common Spacecraft bus, plug and play operational payloads, and operationally responsive launch vehicles. This should result in characteristically simpler, smaller, and cheaper satellites that can be called up and launched within days to weeks rather than months or years.

Space assets are low density, high demand resources. As a result, the Army's Space activities must be coordinated with all ser-

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vices and leverage any and all available assets. Launch of U.S. military payloads from USAKA/RTS would almost certainly be in support of the U.S. Air Force. The U.S. Air Force would be providing responsive Space support to deployed Soldiers, Sailors, Marines and Airmen deployed around the world. The Army's Space responsibilities begin with the requirements generation process, extend to technology research and development, demonstrations and experimentation, and culminate with presentation of capabilities and forces. Consistent with the Army's Space competencies (i.e. force enhancement, Space control, force application), the Army must determine what Space activities have the greatest potential for mission success, and achieve the desired effects and payoff to the warfighter.

One major element of ORS is the Tactical Satellite (TacSat) Demonstration Program. TacSat is a technology demonstration program that sets out to build smaller, cheaper, simpler satellites to provide relevant Space capabilities, and demonstrate military utility through operational experimentation. The Tactical Satellite program provides the Army and SMDC/ARSTRAT an opportunity to influence and develop satellite payloads to directly address the Land Component and Army's operational capability gaps. SMDC/ARSTRAT is fully engaged in ORS activities.

As the Army executive agent for TacSat, the SMDC/ARSTRAT Technical Center has oversight and responsibility for Army TacSat advocacy and efforts, and is taking the lead for the Army in ORS. In addition, the Technical Center is also the Technical Manager for all Army TacSat payload development efforts. Payload concepts addressing communications on the move and persistent battlefield surveillance/characterization are currently being worked in a joint, collaborative environment with the other services and Combatant Commanders. SMDC/ARSTRAT Future Warfare Center is also developing a Multi-User Ground Station intended to provide payload tasking and Command and Control of Army TacSat sponsored payloads. Space capabilities developed under ORS/TacSat have the potential to provide real-time Space capabilities to the warfighter on the battlefield within weeks rather than months or years.

TacSat 1 is scheduled for launch in December aboard the developmental Space X Falcon 1 rocket. The Falcon 1 is one of two developmental rocket programs being sponsored by the Defense Advanced Research Projects Agency (DARPA) through their FALCON program. Originally scheduled to launch from Vandenberg AFB on the California central coast, Space X moved their operation to RTS. The other developmental DARPA program is the AirLaunch QuickReach launch vehicle. This responsive booster is designed to be airdropped from an Air Force C-17 and launched from altitude. Both initiatives have the potential to offer operationally responsive, low cost launch services for small tactical satellites as required by the Joint Force and the Component Commanders.

High Altitude Platforms

The Army's need to understand and manage the battlespace, however, continues to increase beyond the capability of support by Space based assets. Platforms operating in the high altitude region can support the warfighter by augmenting Space platforms and can provide the products and services needed to support decision-making, planning, and combat operations. These high altitude platforms would operate between 20 km. (12.4 miles) and 100 km. (62 miles). As an example, for platforms positioned at an altitude of 60,000 feet, the line of sight to the horizon is 389 miles providing the warfighting commander with an extended view of the battlefield. Although current HALL platforms are limited to short duration missions of 24 hours or less., future HALL platforms potentially fill capability gaps in persistent 24/7 surveillance and communications capabilities for theater and homeland defense operations.

Lighter than Air platforms will be unmanned, gas-filled airships. There are three Lighter than Air efforts being pursued by SMDC/ARSTRAT. The first effort is the HiSentinel, which is a spiral development that will be launched in-theater with a payload weight ranging from 50-200 pounds and payload power of 200-1,000 W. The first part of the spiral development was an airship that reached an altitude of 74,000 feet in November 2005.

High Altitude Technology Demonstration

This was a technology demonstration that provided valuable lessons learned for the next scheduled launch in November 2007. The second effort supports the Missile Defense Agency High Altitude Airship program. The prototype will have a payload weight of 500 pounds and payload power of 3,000W at an altitude of 60,000 feet for 30-day duration in 2010. The third effort is to provide technical support to the Defense Advanced Research Projects Agency Integrated-Sensor-Is-the-Structure program, which provides a complete system that integrates radar into the airship structure.

The Heavier than Air effort is the Orion Unmanned Aerial Vehicle which is projected to fly at altitudes over 65,000 feet with a payload weight of 400 pounds and payload power of 4,000W. Orion will utilize a newly designed hydrogen powered system and will have the capability to be launched in the U.S. or in-theater and remain on station for four days providing line of sight and Beyond Line-of-Sight communications and surveillance to the Warfighter.

The Near Space Long Loitering Payload Testbed will provide multiple

functions for payload operations. The first function is the modeling and simulation of the HALL platform and payload that will validate the military utility of the HALL concepts and support military modeling and simulation exercises. The second function is the hardware-in-the-loop capability that will provide an interface for payloads to be integrated, tested, and verified prior to demonstration on HALL platforms.

Big Crow Program Office

At a slightly lower altitude, SMDC/ARSTRAT's Big Crow Program Office provides support to customers that ranges from Electronic Warfare threat environments, Telemetry recording and retransmit, air refueling, Information Operations, technology prototyping and demonstrations, and training. Customers supported by the Big Crow Program Office are the U.S Navy Program Office for Aegis, the National Aeronautics and Space Administration (NASA), the National Reconnaissance Office, MDA, the North American Aerospace Defense Command (NORAD), and the North Atlantic Treaty Organization or NATO.

The Big Crow Program Office was established with a mission to provide Electronic Warfare environments for the purpose of testing U.S. military Radio Frequency sensor, communication and navigation systems. Today, Big Crow's mission and capabilities span the electronic gamut of Electronic Warfare, Telemetry, Radar, Electro-Optical, Information Operation, and System Test Bed. Mobile and world-wide deployable, the Big Crow Program Office offers a variety of unique capabilities to the Nation's research, test and evaluation, training and commercial communities. Two C-135 aircraft, a myriad of smaller fixed and rotary wing platforms, ground platforms, advanced instrumentation, multi-spectral electronics, in-house configuration control and modification authorities, and technical competency are several of the advantages that give the Big Crow Program Office overall technical capability that is significantly greater than the sum of it parts.

Big Crow Aircraft 8050 Supporting Airborne Laser Program

As the operator of the only remaining large-scale airborne Electronic Warfare test platforms, Big Crow is a key national asset that provides a unique combination of capabilities and solutions for test, training, exercises and on-call operations. Big Crow has an unmatched ability to dissect threat systems, identify vulnerabilities, and exploit them to the warfighter's advantage — key characteristics for the delivery of non-kinetic effects to these threat systems. Applied to friendly systems, this offers unique opportunities to exercise and train Tactics, Techniques and Procedures in an operationally realistic threat environment.